Statement of

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Good morning. My name is Daniel Madrzykowski. I am a fire protection engineer with the National Institute of Standards and Technology (NIST) Building and Fire Research Laboratory in Gaithersburg, MD. NIST is a non-regulatory federal research agency that has been specializing in measurements and standards, including fire research, for more than a century. During my 21 years at NIST I have been involved in several research programs involving automatic fire sprinklers. I was also the chair of the National FireProtection Association (NFPA) Technical Committee on Residential Sprinkler Systems from 1996 through 2006.

Council Member Avella requested that NIST provide information on sprinkler research that it has conducted, especially research results that would be relevant to college dormitories and student housing. I am here representing NIST as a result of that request.

According to Campus Firewatch, an organization that collects fire data specific to college students from news accounts, the academic year 2006-2007 was the deadliest year on record with 20 fatalities caused by fire. Since 2000, 108 students have been lost due to fire.

Automatic fire sprinkler systems have been used successfully to protect industrial and commercial buildings for more than 100 years. In 1973, the Report of the National Commission on Fire Prevention and Control, entitled America Burning, changed the focus of sprinkler research from protecting the building and its contents to protecting the occupants of the building. Since that time, NIST has been using measurements and analysis to develop methods to predict automatic sprinkler response and fire suppression effectiveness.

In its most basic form, an automatic fire sprinkler system consists of a water supply, piping to deliver the water from the supply to the sprinklers, and thermally activated sprinklers. Each sprinkler has a temperature sensitive link. Therefore, water is only discharged in the area where the gases from the fire have become hot enough to activate the sprinkler.

NIST has conducted studies using full-scale fire experiments to examine the impact of automatic sprinklers in terms of fire control and life safety. These studies have included health care occupancies, office occupancies, medical laboratory occupancies, residential occupancies, and dormitories. In all of these studies, sprinklers installed in accordance with the appropriate NFPA sprinkler installation standard (NFPA 13, 13D or 13R), were shown to be effective in preventing flashover, controlling the fire and in many cases completely extinguishing the fire.

As an aside, flashover is the transition from a fire condition that is limited to one portion of a room to a fire condition where the entire room and contents are burning. Even fire fighters in protective clothing can not survive under these conditions.

Since the amount of heat and toxic gases produced by the fire is reduced by the sprinklers, the environment in areas adjacent to the fire room and in many cases in the fire room itself remains tenable for building occupants.

During my career at NIST I have examined many fire tragedies. As with most fatal incidents, there is typically more than one item or action that leads to a catastrophic failure. Therefore, fire safety relies on multiple components to provide a complete system to improve a person's chances of surviving a fire. The building fire safety system should include: compartmentation of spaces within a building, smoke alarms, automatic sprinklers, an adequate and well marked egress path out of the building, and occupant training.

For example, a fire starts on a bed. The smoke from the fire rises until it contacts the ceiling and then contacts the walls and a smoke layer begins to develop. If the door to the bedroom is closed, the smoke will continue to collect in the bedroom but the spread of smoke to other areas of the building will be limited by the closed door, i.e. compartmentation. If a smoke alarm is located in the bedroom, it will activate when the level of smoke exceeds its detection threshold.

This provides an early warning to occupants that can hear the alarm. As the fire continues to grow, it is releasing more energy, which results in hotter combustion gases. If there is an automatic fire sprinkler in the room, when the combustion gases exceed the temperature threshold, typically 165 °F, the sprinkler will activate and control the fire. If the building occupants have been trained to recognize the sound of the fire alarm system and how to respond to it, then they can take the required actions and follow the exit markings to make their way safely out of the building. When the fire department arrives, they would have a fire that has not spread beyond the room of origin and can be suppressed easily. With all of the systems in place and functioning, this scenario would result in no life loss either to building occupants or to fire fighters.

It is important to recognize that any of the building systems could fail due to lack of maintenance, human error, or for other reasons. That is why it is important to have all of the safety system components in place. The automatic sprinkler system, however, is the only component of the system whose function is to control the fire and mitigate the hazard in terms of the generation of heat and toxic gases.

In February 2003, a fire in an un-sprinklered night club in Rhode Island resulted in the death of 100 people. The NIST study examining that fire concluded that an automatic sprinkler system would have controlled the fire, reduced the amount of heat produced, reduced the amount of toxic gases produced, and improved visibility when compared to the fire with no sprinklers. In fact, no untenable conditions were created in the sprinklered experiment, while in the un-sprinklered experiment the environment became untenable, by all measures, within 90 seconds of the start of the fire.

In conclusion, NIST's research along with other studies conducted by the United States Fire Administration, and Underwriters Laboratories have demonstrated time and again that properly installed, maintained and operating sprinklers will reduce the hazard from a fire. Given the choice between a sprinklered building and an un-sprinklered building, the sprinklered building will save lives.

I am attaching a copy of the NIST report - Impact of Sprinklers on the Fire Hazard in Dormitories: Day Room Fire Experiments (NISTIR 7120).

Thank you and I am happy to answer any questions the Council members may have.